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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/882,699	06/15/2001	Xiaoming Ren	107044-0009	1351

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EXAMINER

YUAN, DAH WEI D

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 01/29/2003

13

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/882,699

Applicant(s)

REN, XIAOMING

Examiner

Dah-Wei D. Yuan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-110 is/are pending in the application.
- 4a) Of the above claim(s) 1-22 and 63-110 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 24-62 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,7,9,12. 6) ☐ Other: .

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METALIC LAYER COMPONENT FOR USE IN A DIRECT OXIDATION FUEL CELL

Examiner: Yuan

S.N. 09/882,699

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January 15, 2003

Election/Restrictions

1. Applicant's election with traverse of Species IV, claims 24-62, in Paper No. 11 is acknowledged. Consequently, claims 1-22,63-110 are withdrawn from consideration. The traversal is on the ground(s) that the nine species identified in the Office Action no. 6 do not each represent independent and distinct inventions. This is not found to be persuasive because all the individual species has its distinct feature/structure that is not possessed by other species as stated in the Office Action. For example, Species I requires both a metallic anodic diffusion layer and a metallic cathodic diffusion layer, which are not required by Species IV, V, VI, VII, VIII or IX. Species II requires a gas separator, which is not required by Species I, IV, V, VI, VII, VIII or IX. Species IX require means for distributing fuel to the anode, means for distributing oxygen to the cathode and means for coupling the anode to the cathode, which are not required by Species I, II, IV, V, VI, VII, or VIII.

In addition, if Applicant elects claims directed to the product, and a product claim is subsequently found allowable, withdrawn process claims which depend from or otherwise include all the limitations of the allowable product claim will be rejoined.

The requirement is still deemed proper and is therefore made FINAL.

Specification

2. The use of the trademark, Nafion and Teflon, has been noted in this application as well as in claims 36 and 37. It should be capitalized wherever it appears and be accompanied by the

generic terminology. Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 24-62 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 24 recites the limitation "said electricity generating reactions" in line 10. It is not clear what the limitation is referred to. It is suggested to change the phrase to "an electricity generating reaction".

6. The term "generally parallel" in claims 24,41,44,54 has been held to be indefinite, since applicant's specification fails to describe a specific geometry.

7. The term "generally" in claim 24 (lines 13 & 15) is a relative term which render the claims indefinite. The term "generally" is not defined by the claim, the specification does not

provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

8. The term "substantially" in claims 28,49 is a relative term which render the claims indefinite. The term "substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

9. The term "loose" in claims 29,38 and 50 is a relative term which render the claims indefinite. The term "loose" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For the purpose of examination, the claims are interpreted as being recited "... a composition of pieces of metal bonded together....".

10. The term "suitable" in claim 48 is a relative term which render the claims indefinite. The term "suitable" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

12. Claims 24-30,33,37,38,41-51,54-62 are rejected under 35 U.S.C. 102(e) as being anticipated by Cisar et al. (US 6,410,180).

With respect to claims 24, 61,62, Cisar et al. teach a fuel cell that is suitable for operating with gas fuels or, alternatively, directly with liquid fuels, such as methanol. The direct oxidation fuel cell comprises (a) a protonically conductive, electronically non-conductive membrane (54), (b) an anodic metal diffusion layer (metal grid, 82), (c) an anode catalyst (electrocatalyst, 56), which is disposed between the anode catalyst and the anode face of the membrane and (d) a cathode catalyst, which is disposed between the cathode catalyst and the cathode side of the housing. See Figure 6B. The metal grids are served to conduct the current from one cell to the adjacent one.

With respect to claims 25,26, the metal grid (electrically conductive member) may be a sheet of expanded metal mesh or wire. The expanded metal mesh or other electrically conductive member preferably has a great portion of open area than does carbon cloth or paper to increase the gas to and from the catalyst areas. With respect to claim 27, the metal grid can be an expanded metal, a product fabricated by piercing and stretching a sheet of metal or metallic foil.

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A wide range of materials can be used including titanium, nickel, copper, stainless steel, aluminum and niobium. With regard to claim 28, the metal grid can be further gold plated to reduce the contact resistance; i.e., it is inert to the liquid fuel used. With respect to claims 29 and 33, in addition to expanded metal, perforated metal sheets and woven metal wire products, i.e., pieces of metal bonded together that have spaces therebetween, are suitable to employ as the metal grid as well. Both forms of grids have pores with more than one dimension. With respect to claims 30 and 37, mixture of Vulcan XC-72R carbon powder, PTFE, water and surfactant are sonicated to reach complete dispersion and the resulting paste is spread onto the expanded foil grid. With respect to claims 41,42,43, the metal grid is also used as a current collector. Figure 1 show the typical arrangement of a fuel cell in which flow field plates are disposed parallel to the anodic diffusion layer. With respect to claims 44-51,54-56, due to similarity and mirror image between the anodic diffusion layer and cathode diffusion layer on the cathode side of the protonically conductive electronically non-conductive membrane (see Figure 6A), the aforementioned arguments of the former are applicable to the latter. With respect to claims 57-60, Cisar et al. teach the best way to lower contact resistance and improve corrosion resistance is to plate the metallic grid with a layer of precious metal, such as gold, platinum, palladium or ruthenium. See Abstract, Column 2, Lines 58-63; Column 9, Lines 38-67; Column 10, Lines 16-60; Column 12, Lines 39-55; Column 13, Lines 1-55; Example 1.

It is noted that claim 38 is a product-by-process claim. "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the

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product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Since Cisar’s bonded metal piece (woven metal wire) is similar to that of the Applicant’s, Applicant’s process is not given patentable weight in this claim.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 31,32,34-36,39,40,52,53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. (US 6,410,180) as applied to claims 24-30,33,37,38,41-51,54-62 above, and further in view of Yu et al. (US 6,399,202).

Cisar et al. teach a direct oxidation fuel cell system as described above in Paragraph 12. However, Cisar et al. do not disclose the metallic diffusion layer is treated with a substance that renders a portion of the layer hydrophilic. Yu et al. disclose a gas-diffusion electrode for use in a fuel cell system. Specifically, Yu et al. teach the fabrication of gas diffusion electrode with a precisely controlled degree of hydrophobic and/or hydrophilic characteristics by using functional groups. Water-repellent structures of the diffusion layer are generally achieved by coating the

surface with a hydrophobic material, such as polytetrafluoroethylene. The most common method to make the diffusion layer partly hydrophilic includes the use of a hydrophilic fluorinated resin, such as NAFION. As a result, the gas diffusion layer, which has attached at least one hydrophilic organic group as well as at least one hydrophobic organic group, can better promote a hydrophobic/hydrophilic balance in the active layer. See Column 1, Lines 66-67; Column 2, Lines 35-41; Column 3, Lines 17-45; Column 6, Lines 32-37. Therefore, it would have been obvious to one of ordinary skill in the art to treat the gas diffusion layers of Cisar et al. with both PTFE and NAFION[®], because Yu et al. teach the importance of optimum hydrophilic/hydrophobic properties on the gas diffusion layers. With respect to claims 34,35, Yu et al. teach the gas diffusion layer is attached with at least one hydrophilic organic group and at least one hydrophobic organic group. Yu et al. do not specifically disclose relationship between the pore size of the gas diffusion layer and hydrophilicity (or hydrophobicity). However, it is the position of the examiner that such characteristics are inherent, given that pores of different sizes are distributed randomly on the metallic diffusion layer, therefore, at least some of the large pores would be treated with a hydrophilic material while at least some of the small pores would be treated with a hydrophobic material. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature *is necessarily present in that which is described in the reference*. In re Robertson, 49 USPQ2d 1949 (1999).

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Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Isono et al. (US 6,365,293) teach a fuel cell having a gas diffusion layer with a variable water permeability characteristics.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (703) 308-0766. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Dah-Wei D. Yuan
January 16, 2003


Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700